

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

**COMPRESSION TRANSFER AND INJECTION MOULDING
(Code: 3332302)**

Diploma Programme in which this course is offered	Semester in which offered
Plastic Engineering	3 rd semester

1. RATIONALE

A plastic diploma engineer has to supervise operations of injection moulding machines. This competency requires the knowledge of compression transfer and the working principle of different kinds of plastic moulding machines. Hence the course has been designed to develop this competency and its associated cognitive, practical and affective domain learning outcomes.

2. LIST OF COMPETENCIES (Programme Outcome according to NBA Terminology):

The course should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- Operate injection moulding machines for relevant applications

3. Teaching and Examination Scheme

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	200
3	0	4	7	70	30	40	60	

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit
ESE - End Semester Examination; PA - Progressive Assessment.

4. DETAILED COURSE CONTENT

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Compression moulding process	1a. Describe compression moulding machine parts	1.1 Basic principle of compression moulding, Compression moulding press, Type, Manual, Semi automatic, Fully automatic, Constructional details, Heating system, Steam heating, Electric heating, Oil heating.
	1b. Select appropriate material for product	1.2 Material selection criteria, Fillers and additives, Preheating, Bulk factor and performs
	1c. State the steps to operate compression moulding machine	1.3 Moulding process, Complete moulding cycle, Moulding cycle v/s time diagram, Process variables, Post curing, cooling fixtures and finishing, Advantages and disadvantages, Trouble shooting, Start-up and shut down procedure.
	1d. Apply compression moulding techniques on different systems.	1.4 Applications of compression moulding
Unit– II Compression mould	2a. Distinguish different types of compression mould	2.1 Hand compression mould, Mould parts, Function, Types, Open flash mould, Positive mould, Landed positive mould, Semi-positive mould.
	2b. Design compression mould as per requirements	2.2 Assembly and detail drawing, Automatic compression mould, Land length, Pressure pad, Powder well, Core pins and loose parts, significance, Methods of ejection.
	2c. Calculate powder well	2.3 Volume calculation, Height calculation, Press tonnage requirement for mould.
	2d. Distinguish between stripper plate mould and side-ram moulds	2.4 Stripper plate mould, side-ram moulds
Unit– III Transfer moulding process	3a. Describe the concepts of transfer moulding. 3b. Describe the Machine parts of transfer moulding. 3c. State the steps to operate transfer moulding machine for different applications	3.1 Basic principle of transfer moulding process 3.2 Transfer moulding machine, Constructional details, Types, Pot transfer, Plunger transfer, Screw transfer 3.3 Moulding process, Process steps, Process variables, Advantages and disadvantages, Trouble shooting, Start- up and shut down procedure, Applications of transfer moulding

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
	3d. Compare the compression moulding and transfer moulding.	3.4 Compression moulding process
Unit – IV Transfer moulds	4a. Distinguish different types of transfer mould 4b. Design transfer mould as per requirements 4c. Design the various components for transfer mould	4.1 Introduction, Integral pot transfer mould, Mould parts, Function, Factors to be considered for determining pot dimensions, Plunger transfer mould, Types, Top plunger, Bottom plunger 4.2 Mould parts, Function, Transfer chamber calculation, Chamber depth, Transfer pressure, Compare Integral Pot transfer mould and Plunger transfer mould 4.3 Venting, gate and runner designs for transfer mould
	4d. Explain cull removing techniques	4.4 Cull and its removal
Unit – V Injection moulding	5a. Describe injection moulding machine parts 5b. Stated the steps to operate injection moulding machine 5c. Discriminate compression, transfer and injection moulding process	5.1 Basic principle of injection moulding, Constructional details of injection moulding machine 5.2 Moulding process, Process steps, Process variables, Advantages and disadvantages, Trouble shooting, Start-up and shut down procedure, Applications of injection moulding process 5.3 Comparison with injection moulding of thermoplastics, Comparison with compression and transfer moulding process.

5. SUGGESTED SPECIFICATION TABLE

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Compression moulding process	12	08	04	04	16
2.	Compression mould	09	04	06	04	14
3.	Transfer moulding process	08	06	04	04	14
4.	Transfer mould	07	04	04	04	12
5.	Injection moulding of thermosets	06	07	04	03	14
	Total	42	29	22	19	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx Hours required
1	I	Identify the different parts of compression moulding machine	04
2		Adjust the settings of a compression moulding machine for producing a particular product	04
3		Calculate compression moulding pressure for Urea formaldehyde(UF)	04
4	II	Use a hand compression mould to produce a given product	04
5		Operate an automatic compression mould for a given product safely	04
6	III	Identify the different parts of transfer moulding machine	04
7		Calculate transfer moulding cycle time for a given product	04
8		Operate a transfer moulding machine for a given product safely	04
9		Calculate transfer moulding temperature for Phenol formaldehyde(PF)	04
10	IV	Design to produce integral pot transfer mould for a given product	04
11		Design plunger transfer mould for a given product	04
12	V	Identify the parts of an injection moulding machine	04
13		Operate an injection moulding machine safely	04
14		Plan in detail sequence of operations required for making a given product using injection moulding	04
Total			56

7. SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Students will collect moulded products of thermosets material and would comment on their quality.
- ii. Students will collect information related to the experiment through internet.
- iii. Students will visit nearby thermosets processing industry.

8. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Lecture and demonstration
- ii. Practical exercises
- iii. Mini project

9. SUGGESTED LEARNING ACTIVITIES

A) List of Books

Sr. No.	Title of Book	Author	Publication
1.	Plastic Materials and Processes	Goodman	
2.	Injection Moulding	Irvin I. Rubin	
3.	Thermosetting Plastics	J.F. Monk	
4.	Plastic Engineering Handbook	Berins	
5.	Injection Moulding Handbook	Rosato and Rosato	
6.	Moulding of Plastics	Bikales	
7.	Compression Moulding	Davis	
8.	Injection Moulding Handbook	Fredoz	
9.	Injection/Transfer Moulding Of Thermosetting Plastics	Wright	
10.	Plastics Mould Design	Bebb	
11.	Plastics Mould Engineering Handbook	Dubois and Pribble	
12.	Handbook of Plastic Technology	Allen and Baker	

B) List of Major Equipment/ Instrument with Broad Specifications

- i. Compression moulding machine
- ii. Compression hand mould
- iii. Compression automatic mould
- iv. Measuring instrument
- v. Transfer moulding machine
- vi. Transfer mould
- vii. Injection moulding machine
- viii. Injection mould

C) List of Software/Learning Websites

- i. http://www.plenco.com/plenco_processing_guide/Sect%2014%20Prefforming%20and%20Preheating.pdf

- ii. http://www.efunda.com/processes/plastic_molding/molding_transfer.cfm
- iii. http://www.eng.su.ac.th/che/old53/faculty_and_staff/sirirat/slide_polymer_processing_pdf/polymer_processing_10.pdf
- iv. <http://www.standardplasticscorp.com/pages/products.htm>
- v. <http://www.longmold.com/more.php?id=14>

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. A. S. Amin**, Lecturer in Plastic Engineering, G.P., Ahmedabad
- **Prof. M. K. Thakarar**, Lecturer in Plastic Engineering, G.P., Valsad
- **Prof. B. I. Oza**, Lecturer in Plastic Engineering, Govt. polytechnic, Ahmedabad
- **Prof. N. C. Suvagya**, Lecturer in Plastic Engineering, G.P., Chhotaudepur

Co-ordinator and Faculty Members from NITTTR Bhopal

- **Dr. Anju Rawley**, Professor, Dept. of Applied Sciences
- **Dr. Abhilash Thakur**, Associate Professor, Dept. of Applied Sciences